Assessments of the Land Use and Land Cover Change effects to Carbon Storage in Sam Lout Multiple Use Area, Battambang Province

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Background

The Cambodia is a country rich in natural resources especially forest, biodiversity habitat and natural ecosystem which millions of Cambodians have relied upon for their daily lives. Although the Royal Government of Cambodian (RGC) is committed to reducing greenhouse gas emissions to contribute to global efforts on climate change, forest cover has declined gradually due to wars, over exploitation, shifting agriculture, conversion of forestland to agricultural land, forestland grabbing.

For example, the conversion of forest cover to agricultural land has resulted in a loss of biodiversity, carbon sequestration, watershed protection and other ecosystem services provided by forests. In addition, it has increased the risk of soil erosion, land degradation and water pollution due to the intensive use of fertilizers, pesticides and irrigation (Sourn et al., 2021). Another LULC change in Cambodia is the expansion of built-up areas, such as urban centers, industrial zones and infrastructure development. This change has contributed to the economic growth and modernization of the country, but also posed challenges for urban planning, waste management, energy supply and public health. Therefore, it is important to monitor and analyze these changes using reliable data sources such as satellite imagery and GIS tools. This action will help assess and redirect the current and future policies and implementations in order to balance the competing demands for land use and ensure the sustainability of the environment and human well-being especially the carbon storage in the different of the LULC types.

Figure 1. Target area for conducting the research

This This study selected Sam Lout Multiple Use Area (SMUA) for the case study. SMUA is large multiple use management area in northwestern Cambodia. It is part the Cardamom Mountains and located in Battambang and Pailin Provinces. SMUA covers 600 km2 of land near the Thai border and was declared a protected area in 1993. Sam Lout is the last remaining tropical rainforest in north-western Cambodia. It is home to a wide array of rare vegetation and wildlife, including the endangered Asian Elephant. Its networks of rivers provide the main drinking water, food and health securities for almost 1 million people. Tens of thousands of small farmers rely on its water system to irrigate crops before flowing into the country's largest permanent body of fresh water, the Tonle Sap Lake. Sam Lout 's Stung Sangke River plays an essential role supporting the lake's important fishery and lowland agricultural lands.

Objective

The main objectives of this research are three-fold.

(1) To generate the land use land cover mapping from 2016 to 2020

(2) To identify the main drivers of land use land cover change from 2016 to 2020

(3) To estimate the carbon storage based on the LULC change in SMUA

Approaches and technology used

This The methods of this study begin with the acquisition of Landsat 8 OLI/TIRS and Sentinel-2A satellite for the year from 2016 to 2020 from the GEE application. It follows up by the further acquisition acquired was cloud free image and combined the whole year data. Next, LULC was produced by using supervise classification tool in ArcGIS 10.4 Software based on segmentation tool in eCognition Software and verification of the land use land cover data with high resolution satellite imageries.

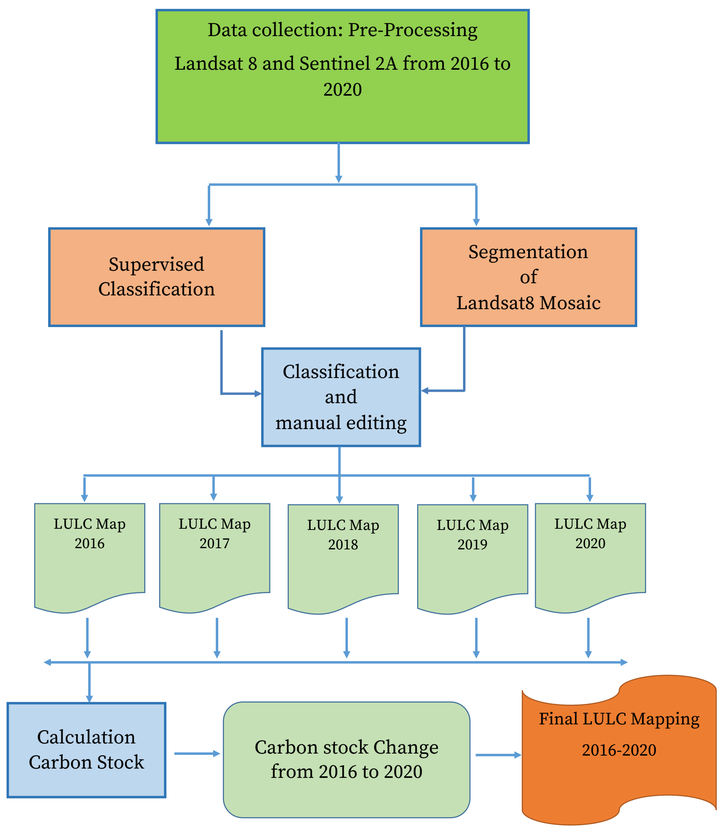

Figure 2. The methodology procedure of the study

Results

The results of my study in the SMUA located in Battambang province serves as a case study and provide outputs and assessment for the proper implementation of policies. The final data are useful for developing appropriate monitoring plans and strategies at national and regions where such efforts are needed.

Based on table here LULC change rate data showed that: forest land in SMUA was decrease from 78,78% in 2016 to 75.08% in 2020 while cropland area was increase from 16,86% to 19,45%. Such losses of forests in the study occurred due to socio-economic growth, increase in the use of agriculture land, population increase, and expansion of resident areas, development of infrastructure, and illegal logging. More narrowly, economic land concessions (ELC) was the predominant driver of deforestation in SMUA and influenced the trajectory of illegal forest conversion. This suggests that implementing REDD+ projects in SMUA could be an effective way to conserve the forest and its biodiversity, while also while also generating income for local communities and the government.

N	LULC Class	2016		2017		2018		2019		2020	
		HA	%	HA	%	HA	%	HA	%	HA	%
1	Forest land	16410	78.78	16390	78.68	16127	77.42	16127	77.42	15640	75.08
2	Cropland	3511	16.86	3582	17.20	3839	18.43	3847	18.47	4052	19.45
3	Grassland	823	3.95	780	3.74	773	3.71	772	3.71	884	4.24
4	Other Land	8	0.04	8	0.04	22	0.11	8	0.04	46	0.22
5	Settlement	2	0.01	1	0.00	1	0.00	8	0.04	127	0.61
6	Wetland	76	0.36	69	0.33	68	0.33	68	0.33	81	0.39

Table 1. Statistic of LULC in SMUA from 2016 to 2020

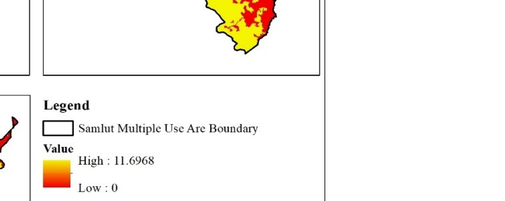

Figure 3.LULC Change in SUMA between 2016 to 2020

Table 2. Total carbon storage in SMUA (ton)

Carbon storage	2016	2017	2018	2019	2020	Total	Avg Per Year
Per year	2,534,394.67	2,209,233.07	2,180,968.55	2,181,681.39	2,165,347.33	11,271,625.01	2,254,325.00
Per hectare	121.663	106.054	104.697	104.731	103.947	541.092	108.218

Finally, table above show the total of carbon storage of all LULC classes by 11,271,625.01 million ton from 2016 to 2020. The average carbon storage in SMUA is calculate by divide with the total area of SMUA. So, the total amount of carbon storage in SMUA is 541.092 ton per hectare with the average of 108.218 ton from 2016 to 2020.

Figure 4.Carbon storage value in SMUA

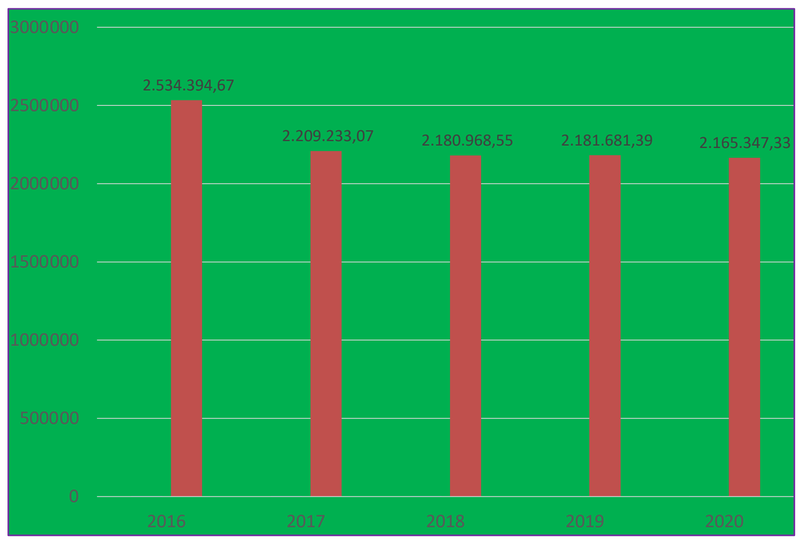

Figure 5.Total carbon storage in SMUA from 2016 to 2020

Scale up plan

The findings of the study provide the loss of forest cover in SMUA has taken based on the complex and combination of

Based on the main findings of this study, it is highly recommended that socio-economic growth, increase in the use of agriculture land, population increase, and expansion of resident areas, development of infrastructure, and illegal logging and ECL. Therefore, the following actions are taken to prevent further LULCC in SMUA:

- ✓ Strengthen law enforcement and monitoring to deter illegal logging and poaching
- ✓ Support community-based natural resource management and alternative livelihoods
- ✓ Develop and implement a REDD+ project in PPWS with stakeholder participation and benefit-sharing mechanisms
- ✓ Conduct regular assessments of forest cover, carbon stocks, and wildlife populations.

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